U. S. FOREST SERVICE

RESEARCH NOTE NC-76

NORTH CENTRAL FOREST EXPERIMENT STATION, FOREST SERVICE—U.S. DEPARTMENT OF AGRICULTURE

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A Basal Stem Canker of Sugar Maple

ABSTRACT. — A basal stem canker of sugar maple is common on trees in lightly stocked stands and on trees on the north side of roads and other clearings in the Lake States. The cankers are usually elongate, usually encompass about one-fourth of the stem circumference, and face the south. Most cankers originated following logging of old-growth stands on stems that had been present as suppressed individuals with a d.b.h. of 1 to 1½ inches. Many of the cankers have failed to heal although more than 30 years old. In some cases a fungal-insect complex appears to have prevented canker closure.

OXFORD: 422.3:416.4:176.1 *Acer saccharum*

During a tour of second-growth northern hardwood stands in Wisconsin in 1964, I noticed a basal stem canker on sugar maples (fig. 1). The cankers occurred on trees along the north side of roads and clearings (fig. 2) or in lightly stocked stands — always on the south side of the trees. In fact, more than two-thirds of the cankers examined faced somewhere between south and southwest. The base of most cankers was within 3 feet of the ground.

Examination of 92 northern hardwood Continuous Forest Inventory sample plots in northern Wisconsin and the Upper Peninsula of Michigan revealed that 2 percent of the sugar maples bore such cankers. Pomerleau[1] reported similar cankers on sugar maple in Quebec.

Typically, the cankers are elongate, 3 to 16 times longer than wide; perfectly round ones are rare. Some of them encompass as much as three-fourths of the total stem circumference, although most affect only about one-fourth of the circumference.

Dissection of such cankers showed that the injury occurred at the interface of growth rings, indicating that the damage had taken place before, during, or just after the dormant period. Callus patterns on the canker faces that indicate past healing attempts vary from no callus layers present (uncommon) to multiple layers (common).

Generally, cankers found on small stems were younger than those found on larger stems. Apparently cankering begins when the trees are young. Dissections showed that cankered 6-inch trees were 1 to 1½ inches when cankering occurred.

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Figure 1. — Canker of pole-sized sugar maple. Notice layers of decaying callus tissue.

[1] *Pomerleau, R. Observations sur quelques maladies non parasitaires des arbres dans le Quebec. Can. J. Res. 22: 171-189. 1944.*

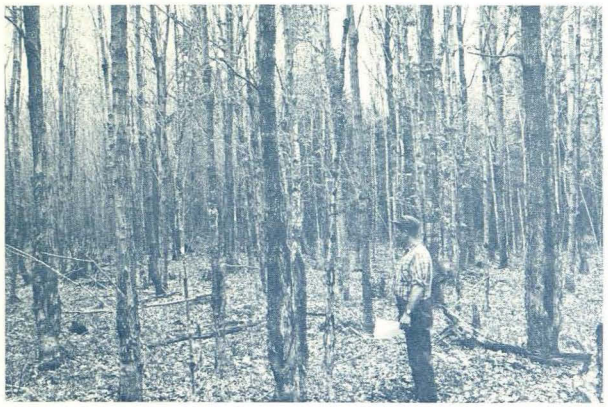

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Figure 2. — Several cankered trees along the north side of a woods road.

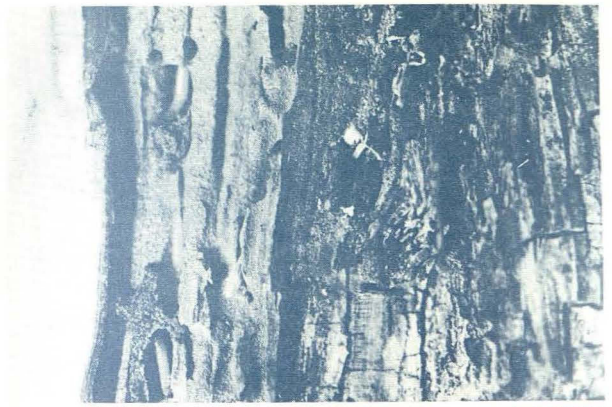

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Figure 3. — Larvae of *Mycetochara bicolor* tunnelling along the edge of a canker.

Cankering is common in stands heavily cut within the past 50 years. Dissection of cankered trees showed that the exposed saplings began to canker after release by cutting and continued to do so over a period of several years.

Many frost cracks were found to have been initiated by cankering. Many cankers either fail to heal (even though more than 30 years old) or else they develop into frost cracks. Dead callus layers visible on such canker faces show that the wound healing process has not proceeded normally. Closer examination and dissection of these cankers disclose the presence of insect larvae and numerous fungal colonists. Fungus and insect activity or repeated frost injury to the cambial tissue may contribute to this failure to heal. The larvae of one insect, *Mycetochara bicolor* Couper, was often found tunnelling at the canker edge near the most recent callus layer (fig. 3). Tunnels of this insect appear to provide a favorable environment for the development of several fungi. Moreover, some fungi colonize the dead bark and exposed wood of the canker face and produce fruiting bodies on the canker face. More than 16 different fungi were found to sporulate on the cankers.

The virulent canker fungus, *Eutypella parasitica,* was found sporulating on about 10 percent of the more than 500 cankers examined for fungal fruiting. The canker causing organisms, *Nectria galligena* and *Hypoxylon mammatum,* were found sportulating on occasional cankers. *Diatrype stigma,* one of the most commonly observed fungi sporulating on the cankers, may be the same fungus reported by Pomerleau[1] as *D. macounii.* Pomerleau described *D. macounii* as contributing to canker development following stem sunscalding. When inoculated into healthy stems of sugar maple saplings, however, *D. stigma* was not pathogenic and no cankers were produced. *Diatrype stigma* seems to be primarily an early colonizer of recently killed bark and wood tissues.

In addition to the fungal sporulators on the cankers, algae, lichens, and slime molds were observed on the canker faces. When isolations for micro-organisms were made from the discolored wood beneath the canker faces, a typical microflora was found, consisting of filamentous fungi, bacteria, and occasional yeast organisms. As might be expected, some of the filamentous fungi proved to be those found sporulating on the canker faces. Other fungi were only isolated from the wood and were not found sporulating on the cankers while some of the canker face sporulators were never isolated from the wood.

Since many of the cankers resemble target-like, perennial Nectria cankers and *Nectria galligena* occasionally was found producing fruiting bodies on cankers, I decided to investigate the possibility that Nectria was a primary factor preventing canker closure. Two Nectria isolation media were developed. These media contained the antibiotics pyrrolnitrin and phytoactin to inhibit the growth of fast growing saprophytic fungi on the isolation plates.[2] Numerous isolations using these media showed that *Nectria galligena* is not commonly associated with these cankers.

The physiological basis for the initiation of this type of injury remains obscure. Pomerleau[1] felt that the injury may be caused by the springtime termination of the stem's resistance to cold. Severe spring frosts would then damage the unhardened tissues.

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[2] *I am grateful to Eli Lilly and Co., Indianapolis, for supplying a sample of pyrrolnitrin and P-L Biochemicals, Inc., Milwaukee, for supplying a sample of phytoactin.*